IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

NCS MULTISTAGE INC.,	§	
	§	
Plaintiff,	§	CIVIL ACTION NO. 6:20-cv-00277-ADA
	§	
vs.	§	
	§	
NINE ENERGY SERVICE, INC.,	§	
	§	
Defendant.	§	

PLAINTIFF NCS'S OPENING CLAIM CONSTRUCTION BRIEF

TABLE OF CONTENTS

Page

I. THE ’445 PATENT 1

II. UNDISPUTED TERMS 4

III. DISPUTED TERMS 4

A. “internal diameter” (claims 1, 22, 28, 50) 4

B. “tubular member” (claims 1, 22, 28, 50) 5

C. “sealing engagement” (claims 1, 22, 28, 50, 55) 5

D. “rupturing force” (claims 1, 22, 27, 29, 56, 57) 8

E. “the rupture disc is…configured to rupture when exposed to a rupturing force greater than the rupture burst pressure” (claims 1, 22, 29, 56) 9

F. “the region of the tubular member where the rupture disc is attached has a larger internal diameter than the internal diameter of the casing string and is parallel to the internal diameter of the casing string” (claims 1, 22, 28, 50) 10

G. “specific gravity of the well fluid” (claims 29, 56) 15

H. “rupture disc is configured to disengage from sealing engagement when exposed to a pressure greater than a hydraulic pressure in the casing string” (claims 28 and 50) 15

I. “disengage the rupture disc from sealing engagement” (claim 55) 18

IV. CONCLUSION 20

TABLE OF AUTHORITIES

Page(s)

Cases

Nautilus, Inc. v. Biosig Instruments, Inc.,
572 U.S. 898 (2014)....................16

Oatey v. IPS,
514 F.3d 1271 (Fed. Cir. 2008)....................5

NCS respectfully offers constructions on a handful of claim terms consistent with the claim language and the intrinsic and extrinsic evidence. In contrast, Nine proposes constructions that are just the opposite. According to Nine, every asserted claim in the ’445 Patent is indefinite, notwithstanding the clear meaning of the terms in light of the plain language, specification, and prosecution history. If it cannot prevail on indefiniteness, in the alternative Nine proposes constructions that twist the claim language in ways that exclude substantial embodiments and contradict the reasons the claims were allowed by the PTO, with the obvious goal of artificially narrowing the ’445 Patent to avoid infringement. For the reasons discussed below, NCS’s proposed constructions should be adopted by this Court.

I. THE ’445 PATENT

U.S. Patent No. 10,465,445 (“the ’445 Patent”) is directed to oil and gas tools. *See* Ex. A, Abstract, 1:16-17, 3:25-33. It teaches rupture disc assemblies and methods of using the assemblies to “float” a casing string into a well. *Id.*

Referring to Figure 1 of the ’445 Patent, shown right, to make a well a borehole is first drilled into the Earth’s crust. Ex. A, Fig. 1. Initially, the borehole is drilled vertically into the Earth (Fig. 1, portion 130 (**green**)). Rodgers Decl. at ¶ 16.[1] When the drilling reaches a target

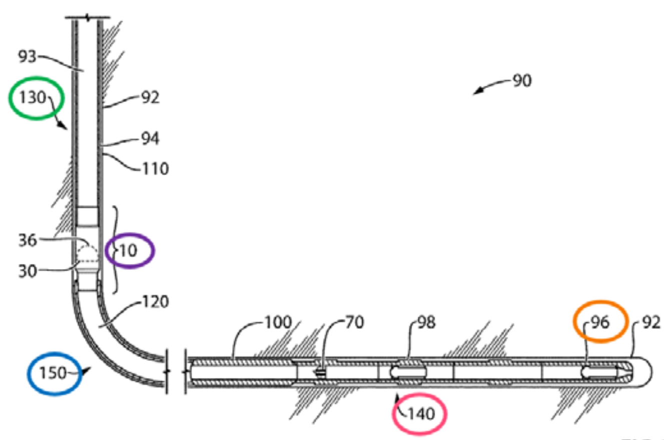


FIG.1

position (hydrocarbon layer), the drilling turns (the heel portion of the well 150 (**blue**)) and then

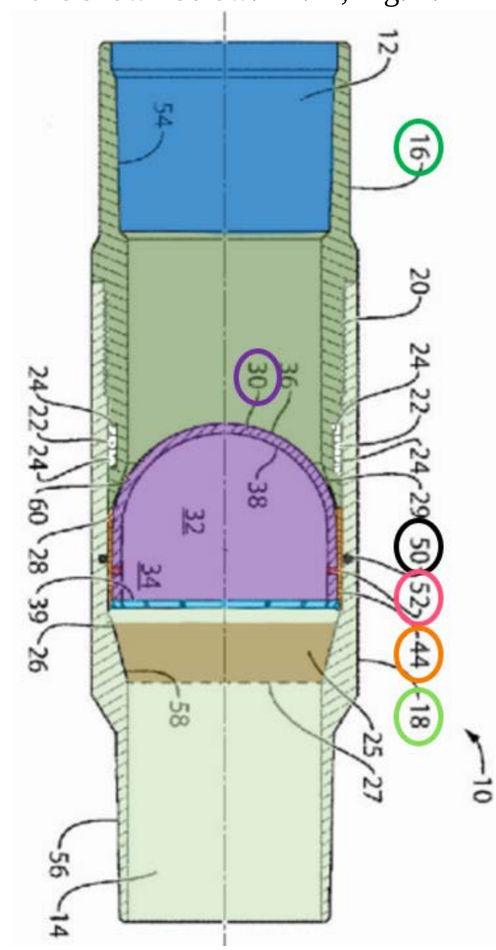
[1] NCS’s Markman brief is supported by the Declaration of expert Dr. John Rodgers (“Rodgers Decl.”), which is filed concurrently herewith.

progresses through the hydrocarbon layer in the lateral direction such that there is a horizontal portion 140 (**pink**) (i.e. the borehole is substantially parallel to the Earth's surface). *Id.* After the borehole is drilled to a target location, pipe called casing string is run into the borehole to maintain the integrity of the well walls. *Id.*, ¶17. As the casing string enters the heel 150 and turns horizontal, it will start to drag on the bottom of the well due to the weight of the pipe. *Id*.; Ex. A, 1:22-29, 5:52-58. As the casing string is pushed out along the horizontal portion 140, it may eventually reach a point where the drag on the casing becomes equal to the force pushing the casing forward such that it will become stuck. To overcome that problem, techniques were developed to "float" the casing string through the horizontal portion 140, which simply means making the casing string buoyant to reduce the drag and extend the reach of the casing string in the horizontal portion 140. Ex. A, 1:30-46; Rodgers Decl. ¶¶ 16-18, 34.

The '445 Patent covers inventive assemblies and methods to float casing string, inventions that now dominate the casing flotation market and are being used without authorization by numerous oil and gas companies, including Nine. In standard operation, an operator at the surface connects a lower seal, such as a float shoe 96 (**orange**), to the bottom portion of the casing string and runs or pushes the casing string to a certain depth in the vertical portion 130. Ex. A, 4:25-40, 5:62-66; Rodgers Decl. ¶ 33. The operator then connects a rupture disc assembly 10 (**purple**) to the casing string, higher up the string from the lower seal. Ex. A, 4:11-24, 6:5-8; Rodgers Decl. ¶¶ 21, 26. The section of casing string between the rupture disc assembly and the lower seal forms a sealed chamber filled with air or gas (the "buoyant chamber"). Ex. A, 5:27-48; Rodgers Decl. ¶21. The operator then fills the casing string above the rupture disc assembly with drilling mud, which builds the hydrostatic pressure inside the string to help push the buoyant chamber further into the wellbore. Ex. A, 6:5-8, 6:16-23; Rodgers Decl.

¶ 26. Because the buoyant chamber is filled with air or gas, it is less dense than the surrounding borehole fluid and therefore tends to "float." Ex. A, 1:22-39, 5:27-48, 13:20-26; Rodgers Decl. ¶¶ 16-18, 34. Thus, when the buoyant chamber reaches the heel 150 there is less downward force against the bottom of the wellbore, reducing the drag and making it easier to run the casing through the horizontal portion 140 to the target position. *Id*.

An embodiment of the novel rupture disc assembly 10 is shown below. Ex. A, Fig. 2. The assembly includes a rupture disc 30 (**purple**) positioned within tubulars 16, 18 (**green & lt. green**). Ex. A, Fig. 2, 7:31-38; Rodgers Decl. ¶ 21. A tubular is simply a pipe-shaped component that can be screwed into the casing string. Ex. A, Fig. 2, 6:67-7-3. The disc is sealed to a securing mechanism 44 (**orange**), which is sealed to the tubulars, via seals 52 (**pink**) and 50 (**black**). Ex. A, 8:44-50, 9:14-19; Rodgers Decl. ¶¶ 21-22. The securing mechanism includes tabs upon which the disc rests (**lt. blue**). Ex. A, 9:67; Rodgers Decl. ¶23.



Back to operation, after the casing string is "floated" to the target location, the operator then begins a procedure to secure the string in place and allow fluid flow through to the end of the string. Ex. A, 6:24-49. To do so, the operator increases hydraulic pressure of the fluid in the string and at a certain pressure the force acting on the rupture disc 30 "overcome[s] the engagement function of the securing mechanism" (e.g, in the above embodiment, the securing mechanism's tabs shear). Ex. A, 6:25-35, 9:67-10:6; Rodgers Decl.

¶27. That releases the disc so that it accelerates in the downhole direction. Ex. A, 6:25-35, 9:67-10:6; Rodgers Decl. ¶¶27, 35. The disc then impacts a surface that ruptures the disc. Ex. A, 6:32-35, 10:6-16, 41-47; Rodgers Decl. ¶27. After rupture, the passage formed by the internal diameter of the string is now open to allow fluid to flow through unimpeded. Ex. A, 6:62-7:10, 10:47-53; Rodgers Decl. ¶¶20, 28.

II. UNDISPUTED TERMS

The parties agree to the following constructions:

Claim Term	Joint Proposed Construction
"a pressure…greater than a hydraulic pressure in the casing string" (Claims 28, 50, & 55)	an applied pressure that is greater than the hydrostatic pressure in the casing string
"float shoe" (Claims 15 & 43)	a sealing device disposed at the lower end of the casing string
"a portion of the sealed chamber is buoyant in the well fluid" (Claim 46)	the density of a portion of the sealed chamber is lower than that of the surrounding wellbore fluid

III. DISPUTED TERMS

A. "internal diameter" (claims 1, 22, 28, 50)

NCS's Proposed Construction	Nine's Proposed Construction
No construction.	the diameter of a fluid channel measured perpendicularly from the inner wall of the fluid channel through the center of the casing string, to the opposite inner wall.

NCS contends this term needs no construction while Nine offers a construction that is overly limiting, confusing and wrong. The term "internal diameter," when used in the petroleum drilling industry to describe piping, like casing string, can have two meanings. One meaning is a cross-sectional line segment from a wall of the pipe to the wall on the opposite side of the pipe. Rodgers Decl. ¶ 43. That is the more common understanding in other industries. However, in the petroleum industry, internal diameter can also mean the walls of the pipe, as opposed to the distance between the walls. Rodgers Decl. ¶¶ 41-42. The term is used this way frequently in the

specification. *See* Ex. A 1:47-49, 62-67, 2:40-44, 6:62-66, 7:3-10, 8:64-66, 10:47-53. A POSITA[2] readily understands the usage of "internal diameter" from its use in context. That is why no construction is necessary. Nine's construction is improper in that it imposes a single definition on internal diameter, and then adds other requirements that are not supported like a "fluid channel."

B. "tubular member" (claims 1, 22, 28, 50)

NCS's Proposed Construction	Nine's Proposed Construction
No construction.	an upper tubular member and a lower tubular member coupled with the upper tubular member

NCS contends this term does not need construction, while Nine is proposing a construction that improperly excludes embodiments. As explained in the '445 Patent specification, the rupture disc is installed in "**one or more tubulars**…." Ex. A, 6:66-7:3, 7:17-21. In other words, a "tubular member" can refer to one tubular, or it can refer to multiple tubulars coupled together. Nine's construction attempts to limit "tubular member" to coupled tubular members, which is not what the term plainly says and improperly excludes the express embodiment where the disc is within one tubular. *Id*.; *Oatey v. IPS,* 514 F.3d 1271, 1276-77 (Fed. Cir. 2008) ("We normally do not interpret claims in a way that excludes embodiments disclosed in the specification…at least [sic] where claims can reasonably [sic] be interpreted to include a specific embodiment, it is incorrect to construe the claims to exclude that embodiment, absent probative evidence on the contrary.")

C. "sealing engagement" (claims 1, 22, 28, 50, 55)

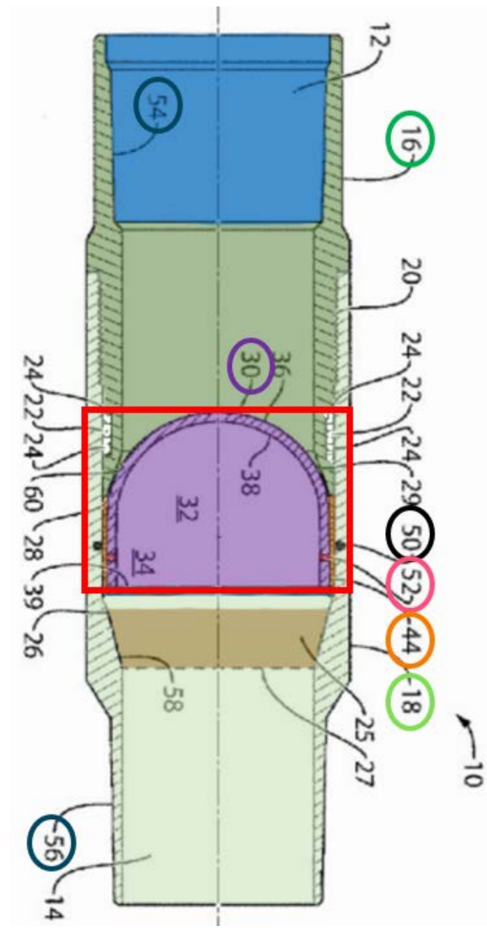
NCS's Proposed Construction	Nine's Proposed Construction
a substantially fluid-tight seal	attached or secured to create a fluid-tight seal

NCS proposes a construction of this term that is consistent with the specification and the

[2] The POSITA is described in Rogers Decl. ¶15.

understanding of a POSITA, while Nine proposes a construction that injects the terms "attached" or "secured," concepts that are not part of this term.

The '445 Patent claims use the term "sealing engagement" to describe the seal between the rupture disc and the region of the tubular member where the rupture disc is initially seated, e.g., the "rupture disc…in sealing engagement with a region of the tubular member" (Claim 28). This sealing relationship is described in extensive detail in the '445 Patent. Referring to annotated Figure 2 to the right, the '445 Patent teaches the rupture disc assembly can be a tubular member made up of one tubular or multiple tubulars 16, 18 (**green**). Ex. A, 6:66-7:3, 7:17-21, 7:33-38; Rodgers Decl. ¶ 21. The tubular member can have threaded ends 54, 56 (**blue**) to connect the assembly to the casing string. Ex. A, 7:59-64; Rodgers Decl. ¶ 22. A rupture disc 30 (**purple**) is initially held in position in a region (**red box**) between the upper and lower ends of the tubular member. Ex. A,6:66-7:3, 8:4-7; Rodgers Decl. ¶¶21-22, 24, 35. In one embodiment, the rupture disc 30 has a substantially fluid tight seal between the rupture disc surface and the inner surface of the tubular member, i.e. a **direct** sealing engagement between the rupture disc and the tubular member. Ex. A, 8:4-7, 19-31; Rodgers Decl. ¶36. In an alternative embodiment, the rupture disc has a substantially fluid tight seal to a securing mechanism 44 (**orange**) via a seal 52 (**pink**), and the securing mechanism 44 can have a substantially fluid tight seal to the tubular member via a seal 50 (**black**). Ex. A, 8:44-47, 9:14-19;



Rodgers Decl. ¶36. In this latter embodiment, there is an **indirect** sealing engagement between the rupture disc 30 and the tubular member. *Id*.

The specification describes the sealing engagement between the rupture disc and the tubular member as a "fluidic seal" or "fluid-tight seal." Ex. A, 2:59-62, 8:67-9:4, 9:22-24. The purpose of this fluidic seal is to ensure that fluid is not allowed to pass between the rupture disc surface and the tubular member into the sealed chamber. Ex. A, 9:26-31, Rodgers Decl. ¶ 37-39. If too much fluid passes into the sealed chamber that could affect the buoyancy of that chamber. Rodgers Decl. ¶¶38-39. However, a POSITA also understands that seals are not necessarily perfect. Rodgers Decl. ¶ 38. Due to natural limitations of materials and machining, as well as the harsh operating environment, it is possible for seals to develop small leaks while still serving their intended purpose. *Id*. NCS's proposed construction recognizes this by including the term "substantially" in the construction.

Nine's proposed construction is similar, but adds the limitations "attached or secured" to create the fluid tight seal, limitations that are not supported for this claim term and are also wrong. First, this claim term merely recites the sealing **relationship** between the rupture disc and the region of the tubular member where the disc is initially positioned, i.e. a "substantially fluid-tight seal." It does not recite **how** that relationship is made, such as by some sort of "attachment" or "securing." Indeed, no components are recited in this term. Second, the term "secure" does not make sense in the context of this term, because a POSITA understands that "securing" the disc refers to keeping the disc from moving in the region, like securing mechanism 44 above (**orange**), not creating a fluid-tight seal in the region. Rodgers Decl. ¶¶24-25, 44. Finally, Nine's construction does not recognize that seals can be imperfect but still meet their intended function.

D. "rupturing force" (claims 1, 22, 27, 29, 56, 57)

NCS's Proposed Construction	Nine's Proposed Construction
a hydraulic pressure or impact force sufficient to rupture the rupture disc	Indefinite Proposed Alternative: "rupturing pressure"

The specification explains the types of "rupturing forces" that can rupture the disc are hydraulic forces alone (also referred to as hydraulic pressure), or an impact force. Ex. A, 3:1-3, 4:60-64, 6:19-21, 11:8-12:6; Rodgers Decl. ¶ 48-49. The disc can rupture due to hydraulic pressure alone if the pressure is above the disc's rupture burst pressure. Ex. A, 3:1-3, 4:60-64, 11:8-22; Rodgers Decl. ¶ 48. When the disc is configured to disengage in the rupture disc assembly, the disc can rupture due to a combination of a hydraulic force that causes the disc to disengage and accelerate in the downhole direction and an impact force when the disc hits a surface. Ex. A, 2:3-30, 10:35-47, 11:27-12:22; Rodgers Decl. ¶¶28-29, 49. Indeed, this disengagement and rupturing of the disc due to a combination of hydraulic and impact forces is key to the invention. *See id*. NCS's proposed construction recognizes the breadth of the term by specifically including the two types of forces in its proposed construction.

Nine first contends the term is indefinite. That position is easily dismissed as the terms "rupturing" and "force" are commonly used terms. Alternatively, Nine proposes the term "rupturing force" be construed as "rupturing pressure." But in doing so it improperly excludes substantial embodiments where the disc is ruptured by impact forces, as opposed to hydraulic pressure alone. Nine's construction also does not make sense in the context of the claims. For example, claim 55 recites "applying a pressure...greater than the hydraulic pressure in the casing string **to disengage the rupture disc from sealing engagement [in a region]**.[3]" In other words,

[3] *See* discussion of term "disengage the rupture disc from sealing engagement," Term I below.

a pressure is applied from surface to move the disc in the downhole direction. Claim 57, which depends from claim 55, recites "further comprising applying a rupturing force to rupture the rupture disc." In other words, after the disc is disengaged, the disc is ruptured by an applied impact force (e.g., the disc collides with a surface). Nine's construction would make claim 57 non-sensical, because it would mean the disc ruptures simply by applying hydraulic pressure. After the disc is moving, it is not **more** hydraulic pressure that ruptures the disc, rather the velocity of the disc when it hits a surface results in an impact force that ruptures the disc.

E. "the rupture disc is…configured to rupture when exposed to a rupturing force greater than the rupture burst pressure" (claims 1, 22, 29, 56)

NCS's Proposed Construction	Nine's Proposed Construction
the rupture disc can rupture if exposed to hydraulic pressure that is higher than its rupture burst pressure	Indefinite Proposed Alternative – "the rupture disc will rupture when exposed to a rupturing pressure greater than the rupture burst pressure"

The specification defines a "rupture burst pressure" as the "the pressure at which hydraulic pressure **alone** causes rupture of the disc." Ex A., 3:1-3; 9:65-67. Again, as explained in Section D above, there are two types of rupturing forces—hydraulic pressure or an impact force. As such, because this claim term refers to a rupturing force relative to the disc's rupture burst pressure, it is necessarily describing an amount of hydraulic pressure that alone can rupture the disc. For example, the rupture disc can be designed to have a rupture burst pressure at 10,000 psi, such that if the rupture disc is exposed to a hydraulic pressure above 10,000 psi it will rupture. *See* Ex. A, 6:19-23; Rodgers Decl. ¶¶28-29, 48. NCS's proposed construction incorporates this concept by construing the term as "the rupture disc can rupture if exposed to hydraulic pressure that is higher than its rupture burst pressure".

The claim term is not indefinite, as described above. Nine's proposed alternative

construction changes the word "rupturing force" to "rupturing pressure," which does not add any clarity for the jury because it does not specify that, when referring to the disc's rupture burst pressure, a "rupturing force" refers to a **hydraulic** pressure that alone can rupture the disc (as opposed to an impact force).

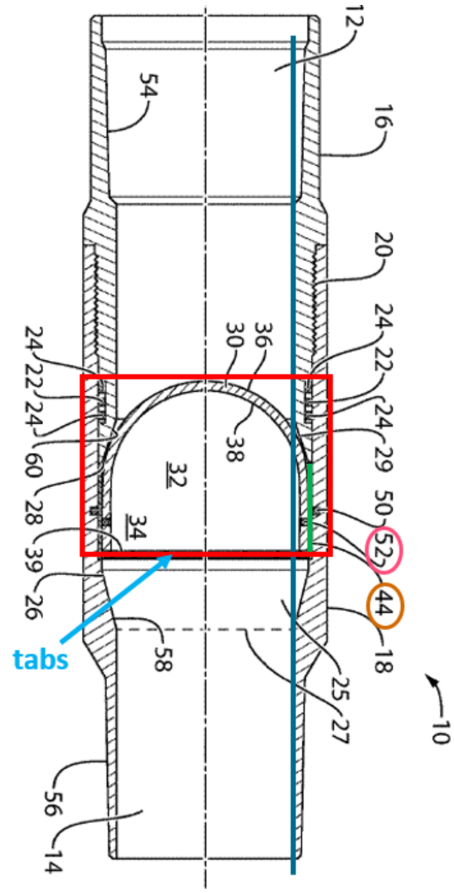
F. "the region of the tubular member where the rupture disc is attached has a larger internal diameter than the internal diameter of the casing string and is parallel to the internal diameter of the casing string" (claims 1, 22, 28, 50)

NCS's Proposed Construction	Nine's Proposed Construction
in the first portion of the tubular member, the rupture disc is directly secured to and in sealing engagement with a cylindrical surface that is wider than and parallel to the inner surface of the casing string	Indefinite Proposed Alternative – a flat surface of the tubular member where the rupture disc is fastened, affixed, joined, or connected to the tubular member is circular and has a diameter larger than the internal diameter of the casing string, and defines a plane that is parallel to a plane defined by the set of internal diameters at a location in the casing string.

This claim term is about the size and shape of the area where the rupture disc rests relative to the size of the casing string and the passageway created by the tubular member. An important aspect of the invention is that the area where the rupture disc is located must not impede fluid flow through the string after the disc is eliminated or ruptured. To accomplish that, the region where the disc rests prior to movement should be wider than the string, and it must also form a pathway that is parallel to the pathway of the string. With those principles in mind, the construction of the claim term in this section of the brief is apparent. In short, the portion of the tubular member where the disc is secured and sealed is wider than and forms a passageway parallel to the casing string. *See* Ex. A, Abstract, 2:40-45, 6:62-7:12; 10:47-53, 13:14-16; Rodgers Decl., ¶¶ 45-47; *see also* claims 1, 22, 28, and 50 ("internal diameter that defines a fluid

passageway”).

Nine disputes NCS’s easily understood construction. Nine contends this claim term is indefinite, but it cannot meet that high bar. A POSITA understands what this term means considering the specification and the prosecution history. For example, referring to the annotated figure to the right, the rupture disc can be held in a region of the tubular member (**red box**) by the surfaces of a securing mechanism 44 (**orange**). Ex. A, Figs. 2-4C, 2:59-65, 8:44-50, Rodgers Decl., ¶¶23-24. The securing mechanism has a cylindrical surface (**green** line) and a bottom surface (e.g., tabs in **blue**). Ex. A, Figs. 2-4C, 9:43-10:2, Rodgers Decl., ¶¶24-25, 45. The bottom of the rupture disc is “seated” on the bottom surface. *Id*. The sides of the rupture disc are in direct sealing engagement with the cylindrical surface of the securing mechanism 44 (**green** line) via o-ring seal 52 (**pink**) between the rupture disc surface and the cylindrical surface. Ex. A, Figs. 2-3, 9:14-24, Rodgers Decl., ¶¶21, 36, 44. In other words, the cylindrical surface is in direct sealing engagement with the rupture disc and directly secures the disc by centering and stabilizing the disc from movement in the lateral direction (i.e. left to right in the image). *Id*. The bottom surface of the securing mechanism stabilizes the disc in the axial direction (i.e. down in the image). Rodgers Decl., ¶¶23-24. Thus, the “securing mechanism generally serv[es] the purpose of holding the rupture disc in the lower tubular member (or any tubular member when for example, alternative configurations are used where the disc is not directly between the lower and upper tubular member), helping to seal the rupture disc in the casing string….” Ex. A, 8:52-



57.

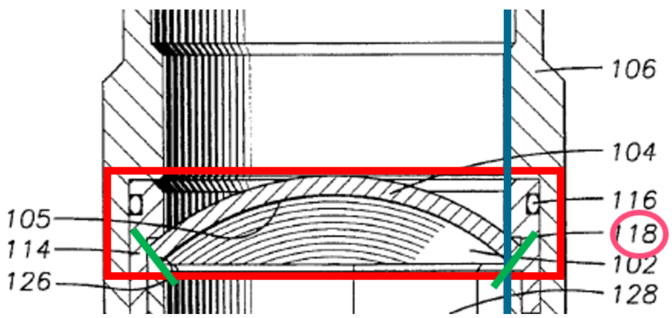
Furthermore, a critical aspect of the invention is that after the disc is ruptured, the diameter of the passageway is restored to the diameter of the casing string so that there is no interference in the fluid passageway due to the rupture disc assembly. Ex. A, Abstract, 2:40-45, 6:62-7:12; 10:47-53, 13:14-16; Rodgers Decl., ¶20, 28. To accomplish this, the cylindrical surface (**green** line) has a larger diameter than the diameter of the casing string, which is also a cylinder (compare distance between **green** line and **blue** line). Ex. A, Figs. 2-3, 6:62-7:10, 8:1-31; Rodgers Decl., ¶¶25, 45-46. Furthermore, the cylindrical surface (**green** line) is parallel to the walls of the casing string (compare orientations of **green** line and **blue** line). Ex. A, Figs. 2-3; Rodgers Decl., ¶¶25, 45, 47. Thus, because the rupture disc is contained in a wider cylinder than the casing string, once the disc is ruptured there are no components interfering with the casing string's fluid passageway. Ex. A, Figs. 2-3, 6:62-7:10; Rodgers Decl., ¶¶20, 28.

The claims recite that the rupture disc is "in sealing engagement with a region of the tubular member…" Consistent with the specification, NCS's proposed construction clarifies for the jury that the "region of the tubular member where the rupture disc is attached" is a surface located in the region (**red box**) that is "directly secured to and in sealing engagement with the rupture disc." NCS's proposed construction also clarifies that this surface being "larger than the internal diameter of the casing string and is parallel to the internal diameter of the casing string" simply means it is a "cylindrical surface that is wider than and parallel to the inner surface of the casing string," like a larger cylinder placed between and in-line with smaller cylinders. Rodgers Decl. ¶¶45-47. That makes sense because a feature of the invention is that the passageway is restored to its unobstructed dimensions after the rupture disc is ruptured.

NCS's proposed construction is also supported by the prosecution history. Rodgers Decl.

¶¶46-47. Claim 1 was rejected over a combination of an industry publication to Rogers[4] and U.S. Patent No. 5,479,986 to Gano (hereafter "Gano"). Ex. B, NCS-Airlock_00003928. The configuration of where the disc in Gano presses against an inside wall compared to how the disc in the claimed invention presses against the inside wall was critical. Figure 3 of Gano is reproduced below side by side with the NCS tool. Ex. C, Fig. 3. As can be seen in Gano, the rupture disc presses against a sloped surface (**green** line). That surface is not parallel to the casing string wall (**blue** line). In contrast, in the '445 Patent figure, the surface where the disc presses against the side wall (**green** line) is parallel to the casing string wall (**blue** line). That difference was important during prosecution.

GANO



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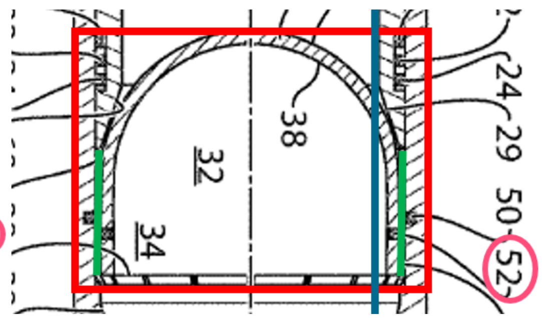


During prosecution, in an effort to distinguish claim 1 from Gano, the Applicant amended claim 1 to recite that the region where the disc is attached has a larger internal diameter than the internal diameter of the casing string. Ex. B, NCS-Airlock_00003903. The Examiner rejected the claim, stating the amendment did not overcome Gano because Gano's disc is also attached to a wider location than the casing string diameter. Ex. B, NCS-Airlock_00003869-70. This is shown in the above view of Gano (compare **blue** line, which is the casing string diameter, to the **green** line). In response, the Applicant amended the claim to point out that the disc is attached to a

[4] Rogers is not discussed here because it does not contain any disclosure which is relevant to construction of this claim term.

surface that is parallel to the internal diameter of the casing string, and argued that Gano's rupture disc is "in sealing engagement with and attached to a region of a tubular member that is not parallel to the internal diameter of the casing string but is instead sloped." Ex. B, NCS-Airlock_00003844, NCS-Airlock_00003852. That can be easily seen in the drawings as discussed above.

Nine's alternative claim construction proposal does not make sense and is inconsistent with the reasons the claims were allowed. First, Nine is attempting to limit the surface where the disc is "attached" to a "flat surface." However, nowhere in the patent is there a description or concept of a "flat surface." In fact, the word flat does not even appear in the patent. That alone shows "flat surface" is a completely fabricated limitation by Nine. Presumably, Nine is trying to limit the claimed point of attachment to the bottom of a securing mechanism (above in **orange**) as opposed to its cylindrical side walls. But nothing in the patent supports inserting that limitation into the claim. On the other hand, parallel, cylindrical surfaces are described in the patent extensively. *See* Ex. A, Figs. 2-3, 9:42-55, 12:7-10.

Second, Nine's construction requires the rupture disc be "fastened, affixed, joined, or connected to" a "flat" surface. As explained in the specification, the disc is not "fastened, affixed, joined, or connected to" any surface. The disc is "seated" on the bottom portion of a securing mechanism 44, and secured to and in sealing engagement with a cylindrical surface. Ex. A, Figs. 2-3, 9:43-47, 67; Rodgers Decl., ¶23.

Third, Nine's construction requires the "flat" surface where the disc is attached be in "a plane that is parallel to a plane defined by the set of internal diameters at a location in the casing string." This construction is confusing and does not make sense. As discussed above, the only "flat" surfaces in the tubular member is a cross-section of the tubular member, e.g. an

"imaginary" surface that extends radially from the center. However, every cross-section in the tubular member is parallel to the surface next to it. That is true for Gano and for the claimed invention. That cannot be what is meant by "parallel."

G. "specific gravity of the well fluid" (claims 29, 56)

NCS's Proposed Construction	Nine's Proposed Construction
No construction.	Indefinite.

This term is definite and also needs no construction. A person of skill in the art understands that the standard definition for "specific gravity" is the ratio of the density of a substance to the density of a reference material. Rodgers Decl., ¶50. In other words, if one fluid has a lower specific gravity than another fluid, then it is less dense than that fluid. *Id*. For example, a specific gravity of a liquid is typically measured with respect to water. *Id*. Thus, the specific gravity of well fluid in a wellbore is simply the ratio of the density of the well fluid to the density of water. *Id*. When comparing specific gravities of two fluids, a POSITA understands that is a way to compare densities of the two fluids. *Id*. A POSITA understands that to have meaning, the two fluids must be measured against the same reference material. *Id*. There is no ambiguity in this term and the experts can easily explain it to the jury, including that the buoyant chamber created by the rupture disc assembly is filled with a fluid that has a lower specific gravity than the specific gravity of the well fluid, i.e. the buoyant chamber is lighter than the well fluid so that there is less drag as the casing is run into the horizontal portion of the wellbore. *See id.*, ¶¶34, 50

H. "rupture disc is configured to disengage from sealing engagement when exposed to a pressure greater than a hydraulic pressure in the casing string" (claims 28 and 50)

NCS's Proposed Construction	Nine's Proposed Construction
the rupture disc, before rupturing, can move	Indefinite

relative to the region when exposed to a pressure that is greater than a hydrostatic pressure in the casing string (i.e. a disengaging pressure)	

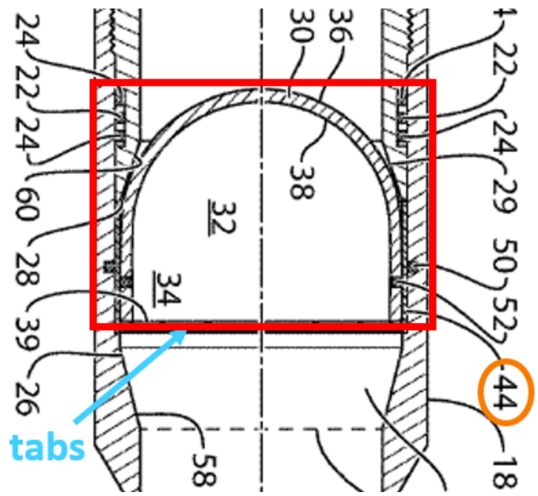
Nine alleges this term is indefinite, but it cannot show that the "claims, read in light of the patent's specification and prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 898-99 (2014). A POSITA understands what this term means, as the "disengaging" feature of the rupture disc is described in extensive and clear detail in the specification and was a major advantage of the invention over prior art disc assemblies.

As described in the '445 Patent, after the rupture disc assembly is connected to the casing string, the casing string is filled with drilling mud above the assembly while it is run into the wellbore. Ex. A, 6:5-8, 6:16-23; Rodgers Decl. ¶26. The weight of the drilling mud creates a hydrostatic pressure in the casing string that helps push the casing string down and through the lateral portion of the well. Ex. A, 6:5-8, 6:16-23; Rodgers Decl. ¶26, 32. The hydrostatic pressure must be less than the rupture burst pressure of the disc so that the disc does not prematurely break during run in (the rupture burst pressure is the pressure at which hydraulic pressure <u>alone</u> can rupture the disc). Ex. A, 6:19-23; Rodgers Decl. ¶¶28-31. For example, the hydrostatic pressure applied to the string could be capped at 1,000 psi, while the rupture burst pressure of the disc is 10,000 psi. Ex. A, 6:19-23; Rodgers Decl. ¶¶28

After the casing string is run to its target position, the rupture disc must be broken in order to open the casing string and allow fluid to flow through the string. Ex. A, 6:24-49. To do so, an operator increases hydraulic pressure, which applies an increasing force on the disc via the drilling mud. Ex. A, 6:25-35, Rodgers Decl. ¶¶27-28. At a certain pressure, instead of rupturing, the disc will "disengage," "causing the disc to suddenly move downward" from the region (the

red box below). *Id*. This disengaging pressure is greater than the hydrostatic pressure, but less than the rupture burst pressure (e.g., hydrostatic pressure = 1,000 psi, disengaging pressure = 3,000 psi, rupture burst pressure = 10,000 psi). Ex. A, 10:56-67; Rodgers Decl. ¶28.

As one example, illustrated to the right, the disc can be held in position in the region of the tubular member (**red box**) by a securing mechanism 44 (**orange**), like an L-bracket, that has tabs extending towards the centerline of the tubular member supporting the bottom surface of the disc (**blue**). Ex. A, Fig. 2, 8:44-50, 9:56-10:6; Rodgers Decl. ¶¶24-25. At the disengaging pressure, the tabs start to bend out of the way or shear off so that the disc is released and moves in the downhole direction relative to the region (**red box**). Ex. A, Fig. 2, 6:25-35, 9:56-10:6; Rodgers Decl. ¶27. Any securing mechanism can be used so long as when the disc is subjected to a disengaging pressure, “the rupture disc **30** is free to move suddenly downward in the direction of the lower tubular member, when freed or released from the constraints of the securing mechanism.” Ex. A, 9:32-39.



After the disc disengages and accelerates in the downhole direction, it ruptures when it impacts a surface within the tubular member. Ex. A, 6:32-35, 10:6-16, 41-47; Rodgers Decl. ¶¶27-28. In other words, the disc does not simply rupture due to hydraulic pressure. Rather, it is configured such that when the pressure is increased to a certain amount, it will move in the downhole direction. *Id*. As the disc moves it accelerates and eventually impacts a surface that ruptures the disc. *Id*. This “disengaging” feature of the rupture disc is fundamental to the ’445 patent’s rupture disc assembly design and its innovation over the prior art. In prior art devices, an

operator could rupture the disc by manually piercing the disc with a tool, which was time-consuming and expensive. Ex. A, 2:1-40; Rodgers Decl. ¶19. The '445 Patent design avoids the need to use piercing tools to rupture the disc, by configuring the disc so that when exposed to hydraulic pressure lower than the burst pressure it will accelerate in the downhole direction and rupture when it impacts a surface. *Id*.

This claim term is definite, reciting the above-described disengaging feature of the rupture disc assembly. NCS proposes a construction that is simple and provides clarity for the jury consistent with the specification and the clear advantages of the invention. To "disengage" means that the disc can "move" before it ruptures. The term "from sealing engagement" has antecedent basis to the disc being "in sealing engagement with a region of the tubular." In other words, "the rupture disc…configured to disengage from sealing engagement" means the disc can move relative to <u>the</u> region, i.e. from the region where it is initially in sealing engagement. This movement happens when the disc is "exposed to a pressure greater than a hydraulic pressure in the casing string," which the parties have agreed means "a pressure that is greater than a hydrostatic pressure in the casing string." *See supra* §II, Undisputed Terms. NCS also adds that this pressure is "i.e. a disengaging pressure" to condense the term so it's easier for the jury to discuss and distinguish between the hydrostatic pressure, the disengaging pressure, and the rupture burst pressure. Rodgers Decl. ¶40.

I. "disengage the rupture disc from sealing engagement" (claim 55)

NCS's Proposed Construction	**Nine's Proposed Construction**
Before rupturing, move the rupture disc relative to the region	disengage the rupture disc from being attached or secured to create a fluid-tight seal

NCS's proposed construction for this term is virtually identical to its proposed construction for Term H above. Thus, all the reasons and evidence NCS offered above to support

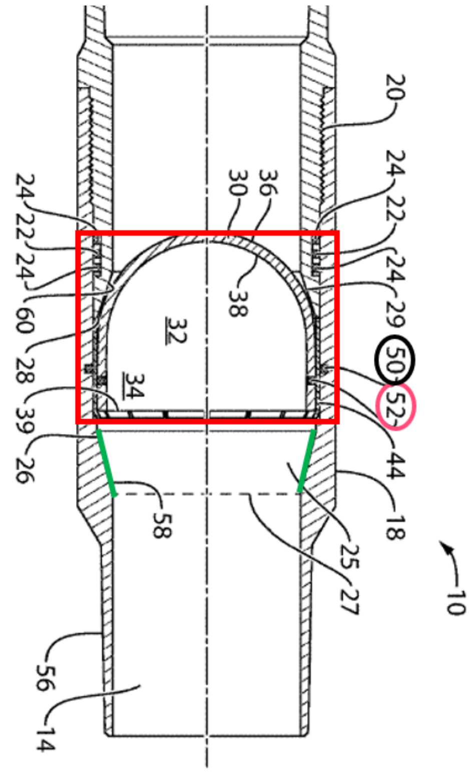
its construction of Term H are incorporated herein by reference in their entirety.

Nine insists this term in claim 55 be construed separately from Term H above, because Term H is purportedly indefinite while this one is not. However, Nine's proposed construction is wrong, and also inconsistent with the claims and the specification.

First, as explained in Term C above, Nine's construction of "sealing engagement" as being "attached or secured to create a fluid-tight seal" adds limitations to that term and is technically wrong. *See* Term C.

Second, Nine's construction effectively says that the disc disengages by losing its seal with the tubular member. But that does not make sense in the context of the entire claim. In independent claim 50, the rupture disc is "in sealing engagement with a region of the tubular member." In claim 55 which depends from claim 50, the method recites "applying a pressure within the casing string greater than the hydraulic pressure in the casing string to disengage the rupture disc from sealing engagement." The term "from sealing engagement" has antecedent basis to the term "in sealing engagement with a region of the tubular member." In other words, this term in claim 55 is referring to sealing engagement with a region of the tubular member, such that the downhole movement of the disc is relative to its sealing engagement in the first region, not that the disc must "disengage" from its seal, as in Nine's construction.

Third, Nine's construction does not make sense in the context of the specification and also improperly excludes substantial embodiments. In the '445 Patent, there is no requirement that the disc lose its seal when it disengages. For example, referring to annotated Figure 1 below,



when the disc disengages from its sealing engagement in the region (**red box**) it is "released from shear ring 44" and moves in the downhole direction. Ex. A, 10:6-7. The disc does not necessarily lose its seal with the tubular member when it disengages and moves downhole. In fact, a POSITA understands that it is desirable to maintain that seal, because it helps the disc accelerate in the downhole direction. Ex. A, 11:45-48, Rodgers Decl., ¶27, 30. Otherwise, if the seal is lost, fluid could escape around the sides of the rupture disc decreasing the pressure on the top of the disc and the disc could lose acceleration. *Id*. Furthermore, as shown in the figure to the right, in one embodiment the seals 52 (**pink**) and 50 (**black**) are maintained all the way until the disc ruptures against an impact surface (**green** lines). Ex. A, Fig. 2; Rodgers Decl., ¶27. That is because there is still sealing engagement while the disc is sliding downward. *Id*. In this embodiment, the seal between the rupture disc and the tubular member is not lost when the disc disengages, it is lost when the disc ruptures. Nine's construction eliminates these embodiments, which is improper.

IV. CONCLUSION

For the foregoing reasons, NCS respectfully requests this Court adopt its constructions, which are consistent with the intrinsic and extrinsic record.

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Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned certifies that all counsel of record were electronically served with a copy of the foregoing on October 30, 2020, via the Court's CM/ECF system.

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